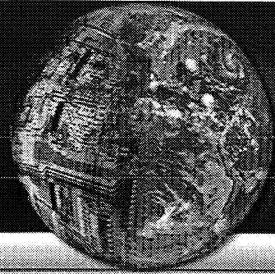


**Playful Physics**

**by**

**David Weaver**





# **MODSIM World 2007**

*Conference & Expo*

*September 11-13*

## **Playful Physics**

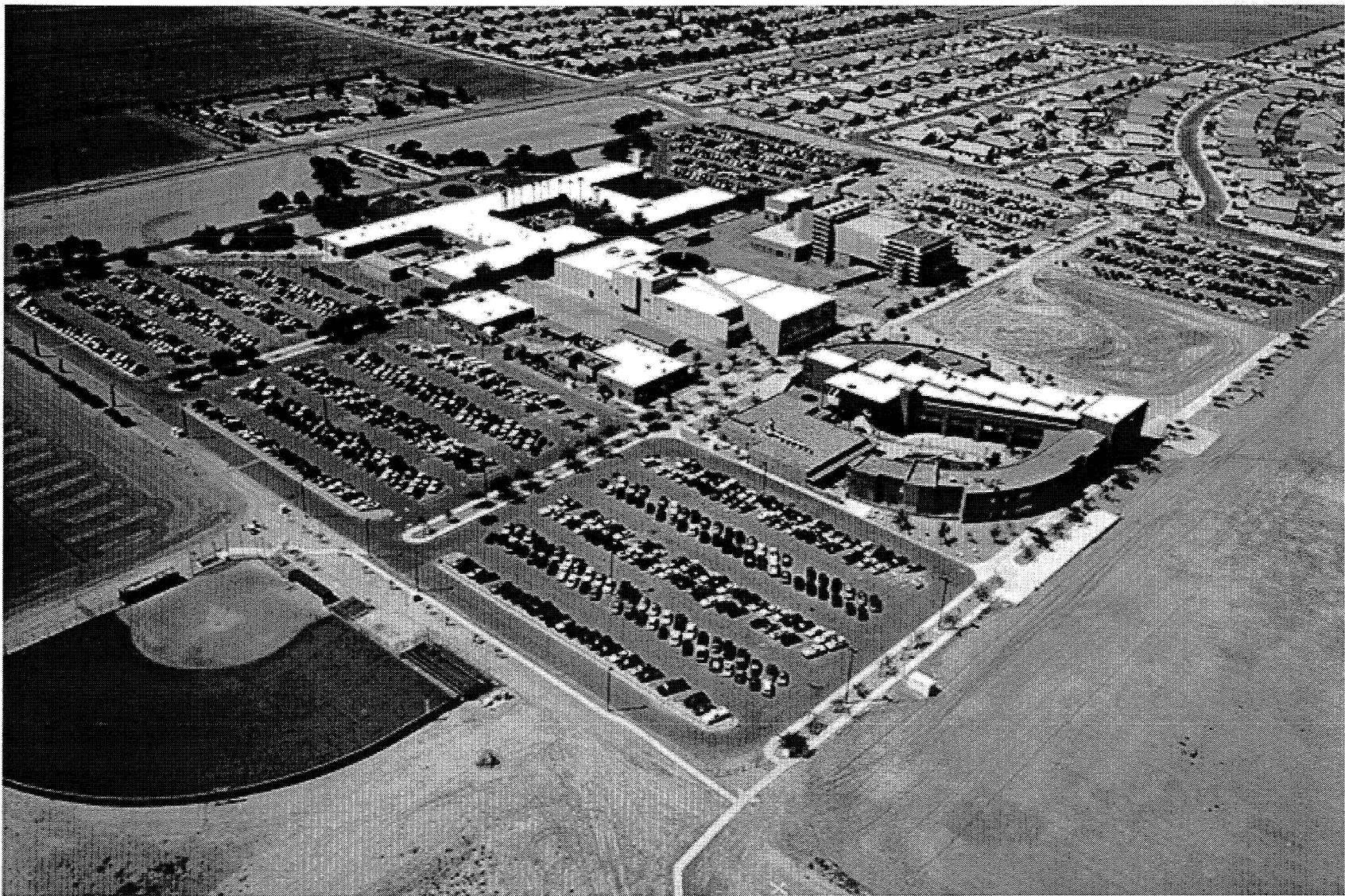
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David Weaver  
Chandler-Gilbert Community College  
Chandler, AZ

# Playful Physics

- Context
- Simulation/Game Experience
- Sabbatical
- Summer Reading/Playing

# Playful Physics



# Playful Physics



# Playful Physics



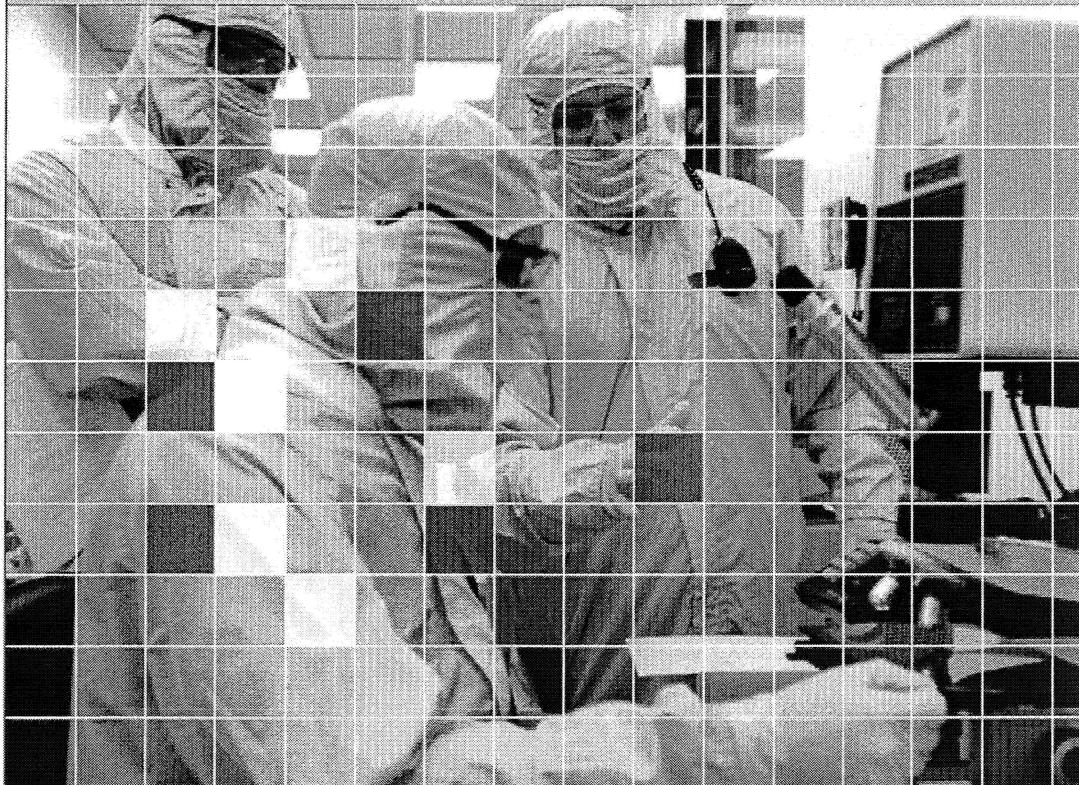
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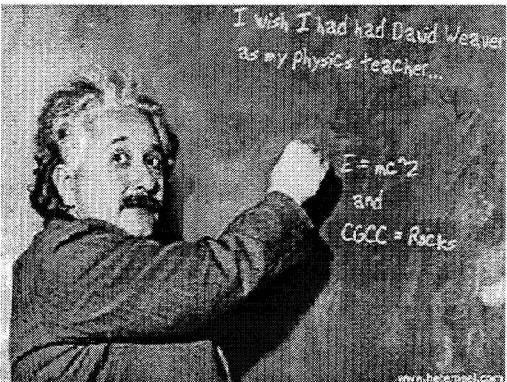
**David Weaver**

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What is this RSS sidebar?

*I wish I had had David Weaver as my physics teacher...*



**Howdy!**

**Welcome to my ePort site!**

This is my 23rd year in the college education biz and I am still excited and delighted to have this gig. I tell people wherever I go that I have the best job in the world. Part of that is because I love the folks I work for and with, but the other part is that I get to explore the world around me with eager students (you **are** eager, aren't you?).

I see physics as a playful medium to divine that which the divine has provided us with. Be you atheist, agnostic, buddhist, hindu, muslim, christian, jew, druid, pagan, or whatever, you must admit that we live in an amazing and beautiful universe with many mysteries to ponder. Physics gives us some very useful tools to explore from the sub-atomic to the cosmic and all points in between.

So, join me as we consider what makes the universe tic...

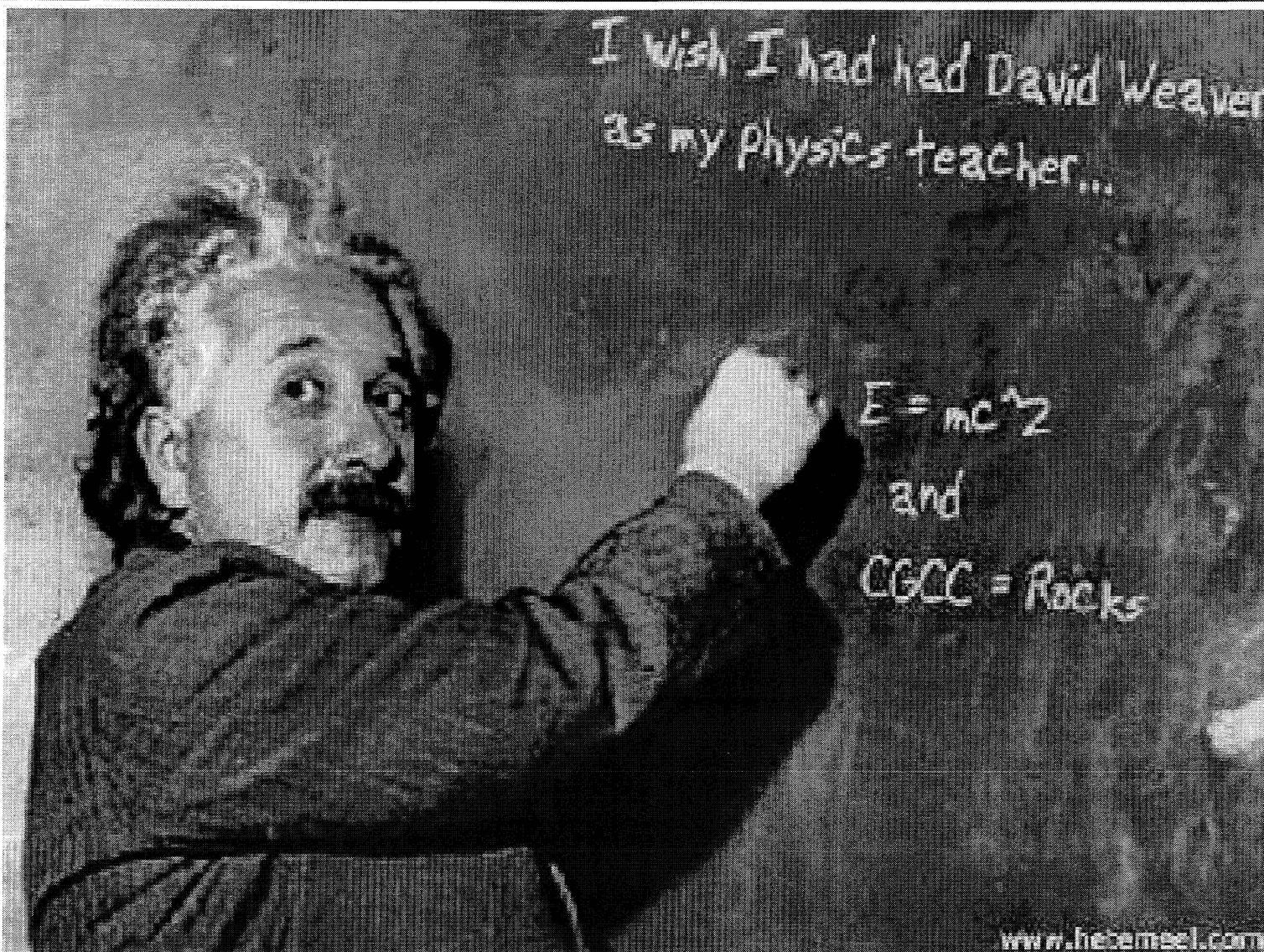
David Weaver • Last update time: Aug 20, 2006 11:49 AM • [Disclaimer](#)

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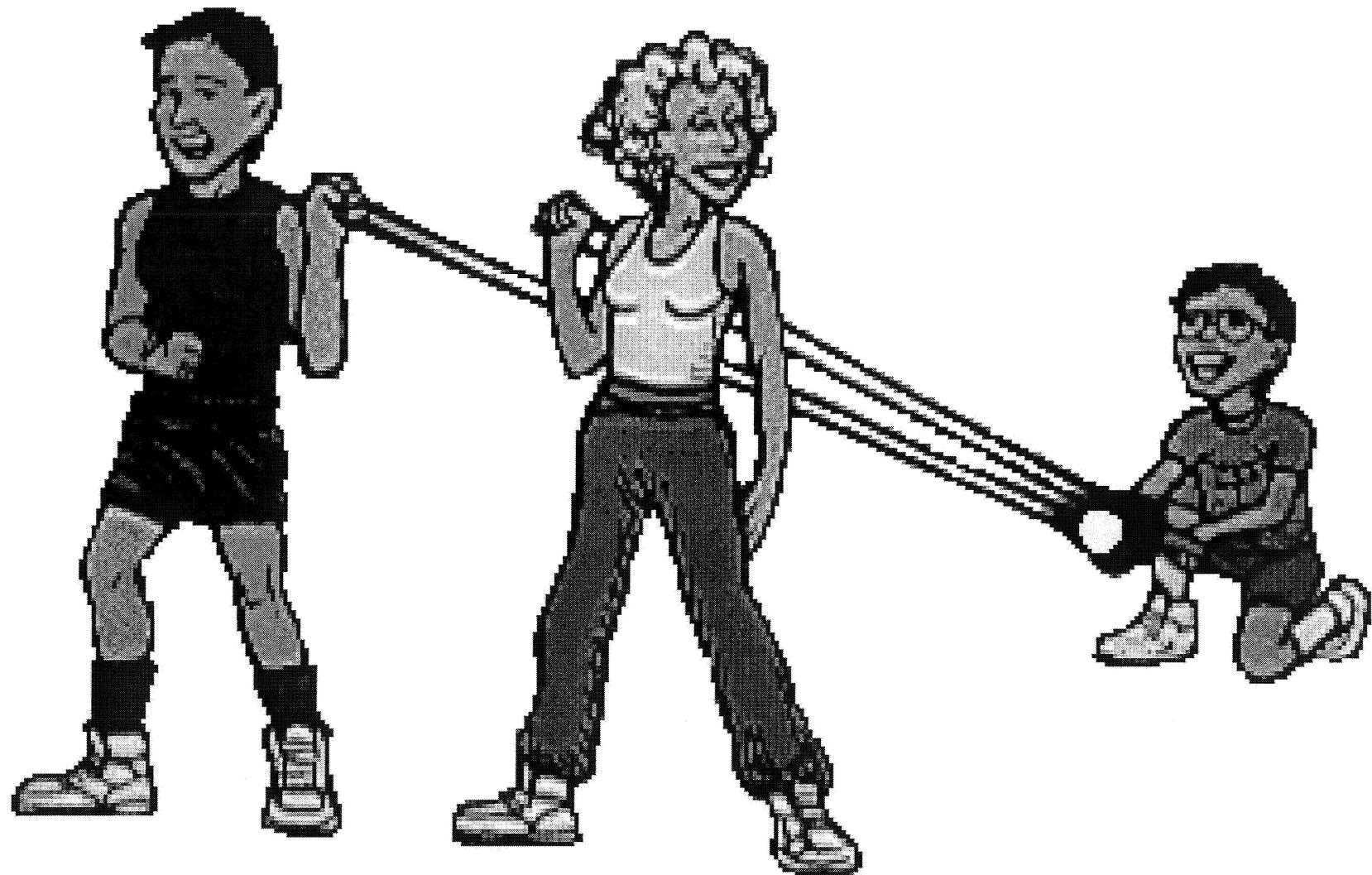


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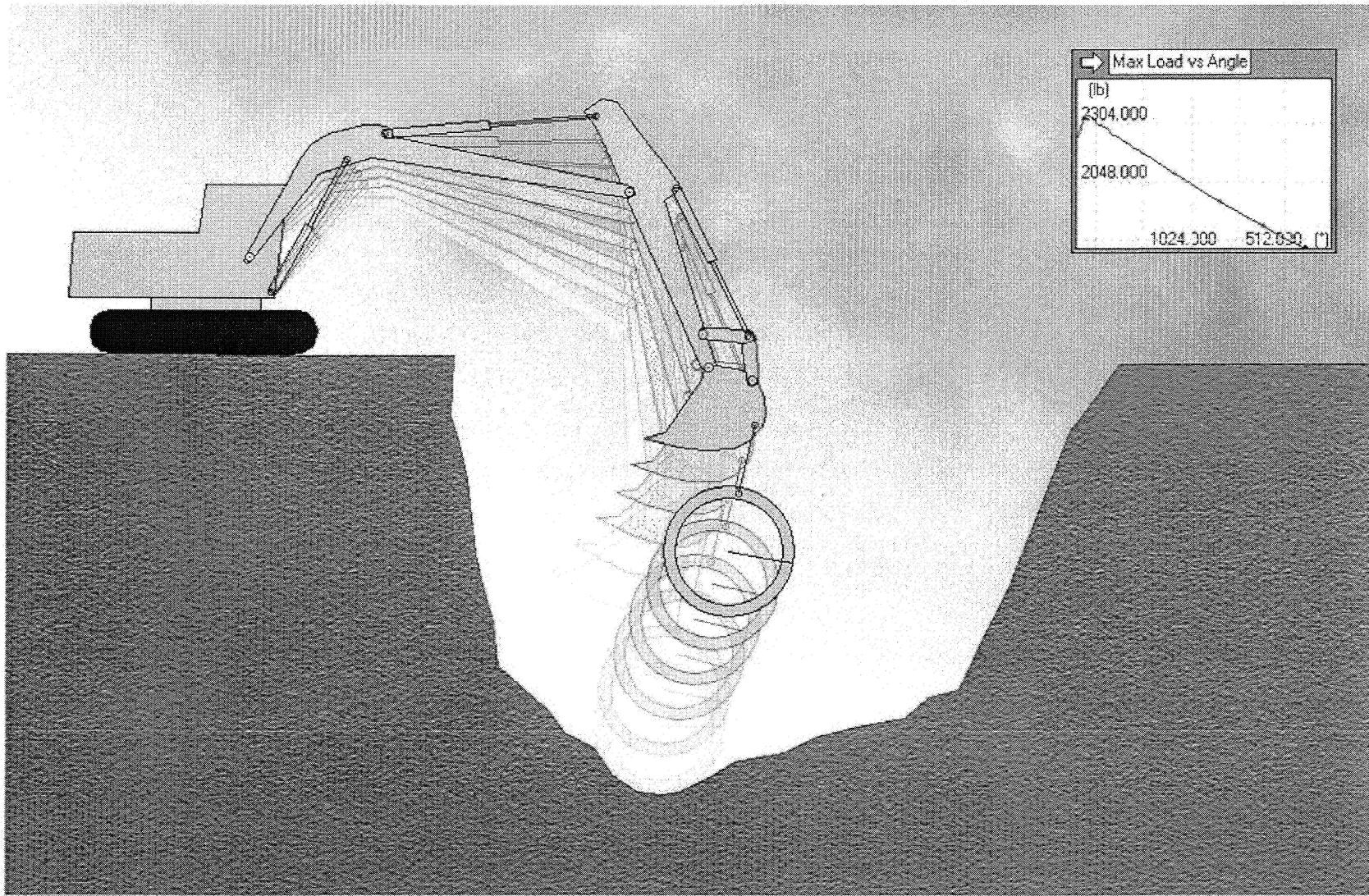
I wish I had had David Weinger  
as my physics teacher...



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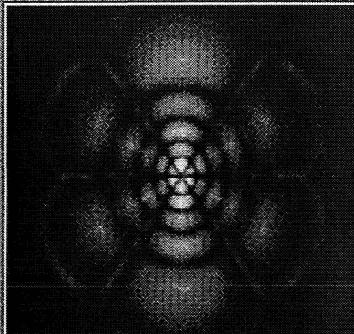


# Playful Physics



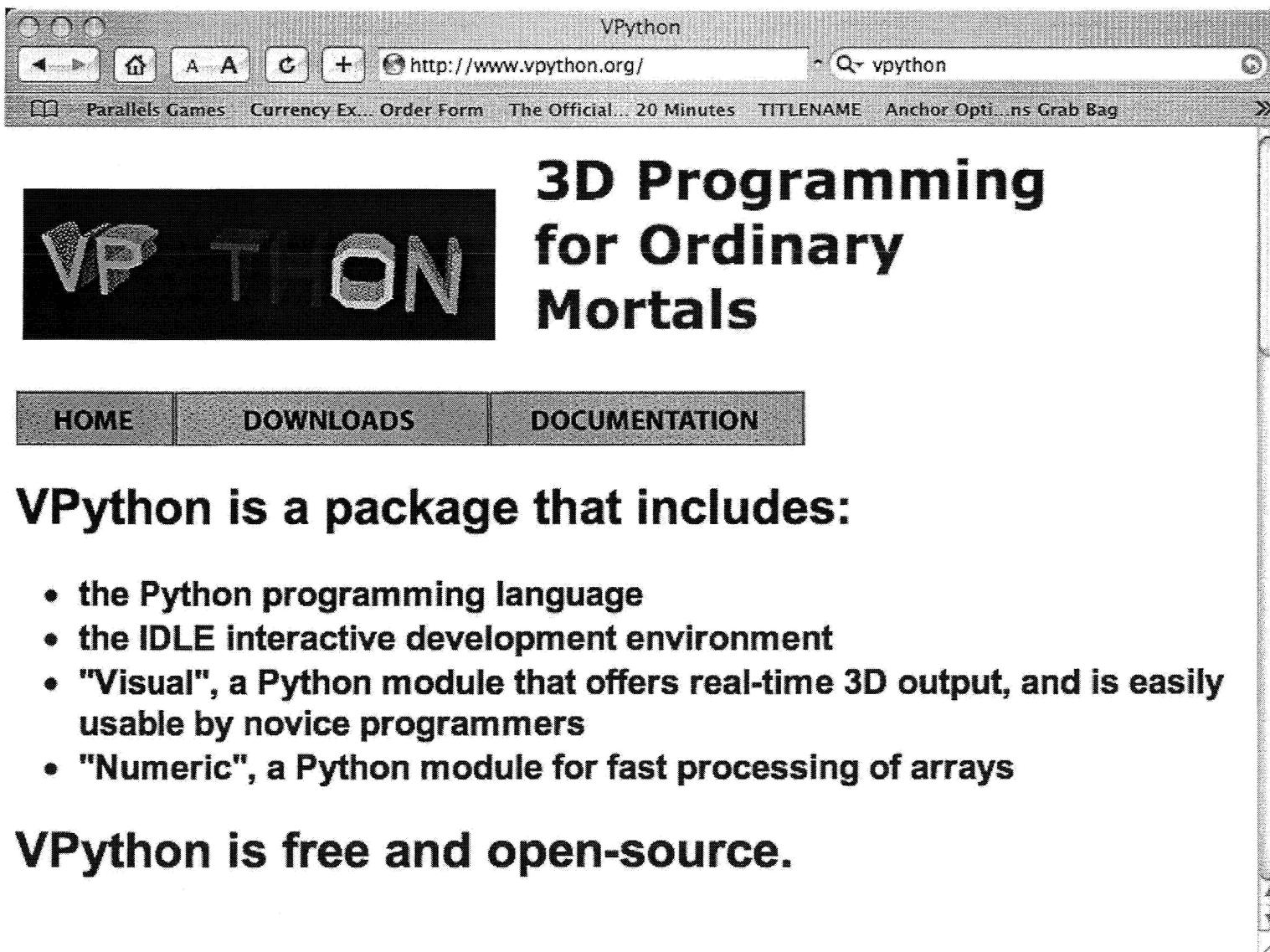
# Playful Physics

## Physlets®



Welcome to the Physlets resource page. Physlets, **Physics Applets**, are small flexible Java applets designed for science education. You do not need to become a Java expert in order to use Physlets. The links on the right contain tutorials, download instructions, and example problems to help you use Physlets in your teaching.

# Playful Physics



The screenshot shows the VPython website homepage. At the top, there is a navigation bar with icons for search, refresh, and navigation, followed by the text "VPython" and the URL "http://www.vpython.org/". Below the navigation bar is a horizontal menu with links: "Parallels Games", "Currency Ex...", "Order Form", "The Official...", "20 Minutes", "TITLENAME", "Anchor Opti...", and "Grab Bag". A search bar with the placeholder "Q vpython" is also present. The main content area features a large logo with the letters "VP" and "THON" in a 3D perspective. To the right of the logo, the text "3D Programming for Ordinary Mortals" is displayed in large, bold, black font. Below this, there is a navigation bar with three buttons: "HOME", "DOWNLOADS", and "DOCUMENTATION".

**VPython is a package that includes:**

- the Python programming language
- the IDLE interactive development environment
- "Visual", a Python module that offers real-time 3D output, and is easily usable by novice programmers
- "Numeric", a Python module for fast processing of arrays

**VPython is free and open-source.**

# Playful Physics

Section 0.0 – Welcome to an electronic physics textbook!

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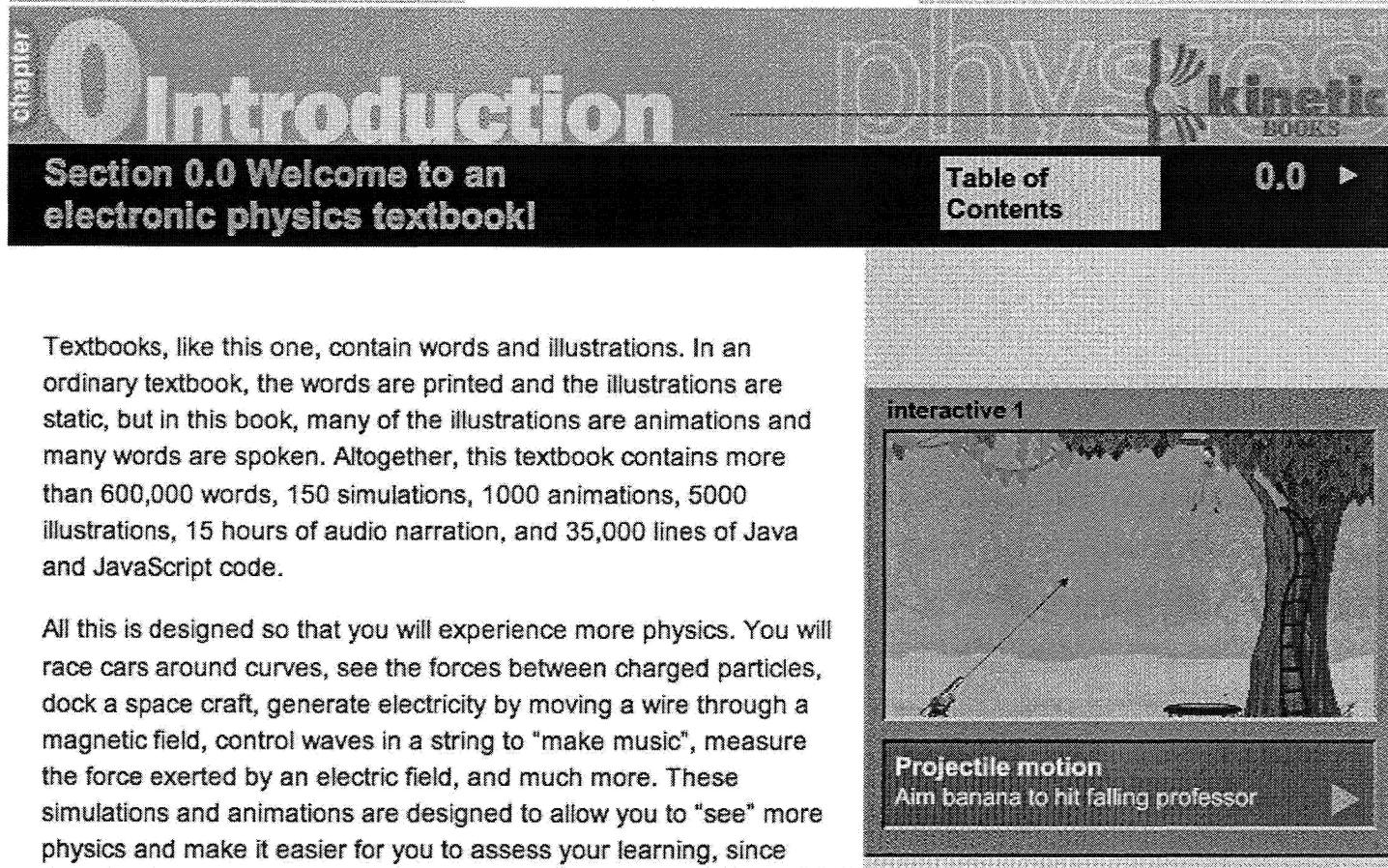
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## Introduction

Section 0.0 Welcome to an electronic physics textbook!

Table of Contents 0.0 ►

Interactive 1



Textbooks, like this one, contain words and illustrations. In an ordinary textbook, the words are printed and the illustrations are static, but in this book, many of the illustrations are animations and many words are spoken. Altogether, this textbook contains more than 600,000 words, 150 simulations, 1000 animations, 5000 illustrations, 15 hours of audio narration, and 35,000 lines of Java and JavaScript code.

All this is designed so that you will experience more physics. You will race cars around curves, see the forces between charged particles, dock a space craft, generate electricity by moving a wire through a magnetic field, control waves in a string to "make music", measure the force exerted by an electric field, and much more. These simulations and animations are designed to allow you to "see" more physics and make it easier for you to assess your learning, since

Applet SimApplet started

# Playful Physics

I hereby request the granting of a sabbatical leave in order to develop curriculum materials that emphasize the connections between physics and digital games. Educational gaming is a burgeoning area of educational research (a Google search resulted in over 40 million hits), but a survey of recent MCCD sabbatical projects and of the Maricopa Learning Exchange suggest no local development yet. Sites like nobelprize.org contain games that teach about topics like LASERs and microscopes. Fermilab has the Fermilabyrinth which provides “A collection of Web-based games and activities to develop an understanding of the operations and experiments that take place in the Fermilab accelerator and detector halls and the scientific ideas they explore.” The <sup>323</sup> Department of Energy offers numerous simulations and games to teach about energy-related topics. A large number of colleges and universities have created myriad games and simulations to help students learn concepts in a playful way. However, there are few materials that make explicit the physics that drive many popular games (race/driving, football, soccer, etc.) and there currently is little in the way of materials showing students how to use tools like VPython and Interactive Physics to build simple games based on sound physics/mathematical models. I believe that students will learn more physics concepts and will be able to create more robust physics models of phenomena by studying the physics at work in their favorite digital games and by creating their own digital games.

# Playful Physics

1. Effectively communicate qualitative and quantitative information orally and in writing.
2. Explain the application of fundamental physical principles to various physical phenomena.
3. Apply appropriate problem-solving techniques to practical and meaningful problems using graphical, mathematical, and written modeling tools.
4. Work effectively in collaborative groups.

# Playful Physics

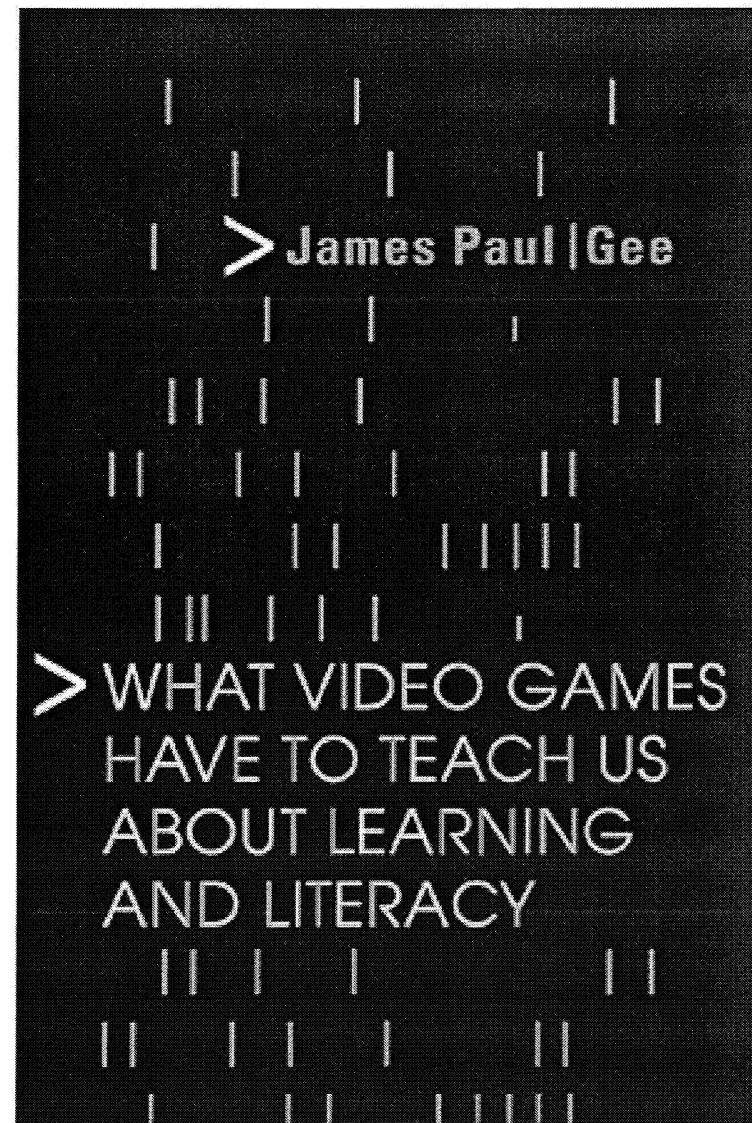
1. **Study game theory, digital game creation, and digital game design physics.** *Being informed as to the underlying theory, design techniques, and physics engine creation will greatly assist my analysis of existing games and design of materials to help students learn simple game creation.*
2. **Use the popularity of digital gaming as a motivational context within which to explore physics.** *A Kaiser Family Foundation study indicates that 83% of children ages 8-18 have video game consoles in their homes. A fundamental precept of Judo is to “ride the horse in the direction it is going,” and most of students have spent many more hours with a gaming control in their hands than they have more “classical” physics applications.*

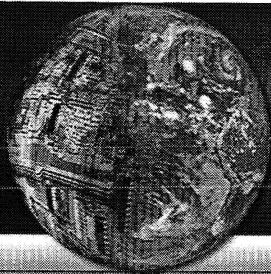
# Playful Physics

3. **Create curricular materials that will allow students to analyze the physics engines in use in popular digital games.** *Popular games (car driving/racing, football, etc.) use physics engines (computer program modules responsible for making objects and characters appear to follow the laws of nature) to make the game action seem more realistic. However, some game actions appear to not strictly follow the physics models that apply to actual people and objects on Earth.*

4. **Create curricular materials that will guide students to use valid physics/mathematical models and software tools like VPython and Interactive Physics to build simple digital games.** *Both VPython and Interactive Physics are used to create physics demonstrations for students to view and/or interact with. By putting students in the role of game creator with these tools, they will likely learn far more physics.*

# Playful Physics





**MODSIM World**

*September 11-13*

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David Weaver

Physics Faculty

Chandler-Gilbert Community College

#### **IV. Professional Development Session**

##### **Scientific and Mathematical Knowledge Acquisition: Professional Development in Interactive Learning Environments**